SCIENCE

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MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Professor J. McKeen Cattell, Garrison-on-Hudson, N. Y.

ON COLOR BLINDNESS.

On the Application of the Flicker Photometer to the Quantitative Study of Color Blindness.

IN the previous number of this JOURNAL, I gave a short account of one of the forms of certain flicker photometers devised by myself, and now will still further illustrate its use by detailing some experiments that were made with it on persons more or less color blind to red. The mode of proceeding was as follows: Plates of deep red and violet-blue glass were placed on opposite sides of the prism and one of the lamps allowed to remain stationary; the blue glass was next to it. On the side of the movable lamp the red glass was placed. In case, then, the patient was more or less blind to red light it would be necessary for him to move up the lamp which furnished the red light nearer to the prism, in order to cause the flicker to disappear, than would be the case in normal vision. This experiment having then been repeated by a person with normal vision, the joint result furnishes the means of measuring the amount of red color blindness, it being, of course, assumed in this procedure that the eyes of the two experimeters are normal for blue light. This determination being finished, I replaced the red glass by green, the blue glass remaining in its old position next to the stationary lamp, and new measurements were made as before by both persons in order to test for green color blindness.

In this manner Mr. T, known to be somewhat color blind to red, was examined, and I found that putting the amount of red light perceived by myself as 100 he perceived only 63.04 per cent. It was also ascertained that his vision was not only defective for red light, but to a less extent for green, he perceiving only 85.5 per cent. of it. A set of control experiments were then made on Mr. T. The blue glass was replaced by the green glass and the red glass was put next to the movable lamp, and for the moment it was assumed that the vision of Mr. T for green light was the same as my own—in other words, green instead of blue light was made the standard, and it was temporarily assumed that both of us were equally affected by green light. The amounts of red perceived by him in two experiments were 71.3 and 70 per cent., as compared with 100 by myself. But as he really perceived only 85.5 per cent. of the green light, to obtain the correct value of his perception of red in these two experiments we must take $\frac{85.5}{100}$ of $70.6 = 60.4$, which differs from the value for the red directly obtained by 2.6 per cent. It may be remarked, in passing, that this case of color blindness was not suspected till revealed by some flicker experiments with colored discs made by myself in Mr. T's presence.

A second case which I examined was of a more pronounced character, and had previously been known to exist. Out of 100 rays of red light perceived by myself, Mr. A. was affected only by 19.44 per cent., violet-blue, as before, being the standard. With the same standard only 86.9 per cent. of the green light was perceived. Taking green as the standard, 22.9 and 23.3 per cent. of red was perceived, and as before, $\frac{86.9}{100}$ of $23.1 = 20$, instead of 19.44, obtained in the direct determination.

The third case of Mr. B. was quite similar to the last, a well-known and pronounced instance of red color-blindness. Violet-blue being taken as the standard, 20.4 per cent. of red was perceived, and 83.8 of green light. Green being made the standard, 25.5 per cent. of red light was perceived, and as before $\frac{83.8}{100}$ of $25.5 = 21.36$, instead of 20.4, as directly obtained when using violet-blue light as the standard.

In these determinations, as in all others of a similar kind which I have superintended, the persons experimented on moved the lamp themselves, without assistance from me, and, owing to the presence of screens, were in complete ignorance of the results they were obtaining. I have been quite surprised to find how quickly persons wholly unused to physical experiments of any kind were able to obtain reliable results with the flicker photometer as now arranged. They needed a little more time, and their probable error was somewhat larger than is the case with an experienced person. Each result given above is obtained from the mean of from ten to fifteen readings registered on the filet of paper connected with the moving lamp. Finally, it is to be remembered that in all of these determinations I have for the time being assumed my own color-vison to be strictly normal, which, now that we have this accurate photometric method, is hardly quite a safe proceeding for any man, or even woman, as some of my unpublished results show.

Ogden N. Rood.
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THE OPENING OF THE NEW LABORATORY FOR PHYSICAL CHEMISTRY IN LEIPSIC.

A short time ago an abstract of the address delivered by Nernst at the opening of the new laboratory for physical chemistry at the University of Göttingen was given in Science. The University in Leipsic has

recently constructed a physical chemical laboratory, which not only equals, but apparently far surpasses, the structure in Göttingen.

As Ostwald points out in the first pages of the pamphlet, 'Das physikalisch-chemische Institut der Universität Leipzig, und die Feier seiner Eröffnung,' Leipsic has taken the lead for a considerable time in physical chemistry. It is true that Kopp worked in Heidelberg as early as 1864, but the work of Kopp belongs distinctly to the older school. The questions raised by him were such as these: What is the relation between the composition of compounds and their physical properties, and what is the relation between the constitution of compounds and their physical properties? Such work, of course, was and is still of great value, but the questions it had to deal with were quite different from those asked by the physical chemist of to-day, who employs also entirely different methods in answering his questions.

Ostwald calls attention to the fact that Kopp was an investigator in his line, rather than a teacher; also to the very poor equipment with which he was provided, the calorimeter with which Kopp's measurements of specific heat were made, being constructed out of a brass match-box. Kopp was invited to Leipsic, but declined the call.

In 1871 Gustav Wiedemann was appointed to the first chair for teaching physical chemistry in Leipsic. On the retirement of Hankel, in 1887, he gave this up, and devoted his entire attention to physics. This left the chair which had been occupied by Wiedemann vacant, and to this Ostwald was called from Riga. He was given the laboratory formerly built for the agricultural chemist Knop, and here all of his work up to the present has been done. The entire laboratory was not given up to physical chemistry, but a part of it was devoted to general elementary chemistry, qualitative and quantitative analysis, and pharmacology. This provision was a wise one, since Ostwald's first semester opened with two students, and the number was reduced to one at the close of the second. The number of students increased until at present it has reached about thirty. In the old laboratory only three small, poorly lighted and modestly equipped rooms were devoted to students in physical chemistry. The difficulties which were being constantly met with are well remembered by everyone who worked with Ostwald during the first ten years of his professorship in Leipsic. The water supply was poor; the method of heating was bad; and, as he himself says, the rooms were too narrow to permit the use of telescope and scale in physical measurements.

When we take into account the conditions under which Ostwald has done his work, and then consider the quantity and quality of the work which has come from his laboratory, we are again reminded, in a forcible manner, of the fact that scientific investigation depends far less upon the equipment than upon the man.

But the 'Leipsic school' of physical chemistry finally completely outgrew its quarters, and a new and elegant laboratory has now been provided. This consists, in reality, of two laboratories, a physical and a chemical. The first story is devoted to the physical, and physical chemical work proper.

One or two points in connection with the equipment of this part deserve special comment. The large research laboratory is provided with one huge thermostat, $370 \times 80 \times 45$ cm. This is provided with thermo-regulators and stirrers, and can be maintained, at a constant temperature, to a hundredth of a degree. This can be used simultaneously, by six or eight students, and is particularly convenient in studying

chemical equilibrium, reaction, velocity, etc. This bath is not used for conductivity measurements, a separate room being provided for that purpose in a quiet part of the building.

Ostwald lays considerable stress upon a weekly meeting of professors, instructors and students, which he holds for the purpose of discussing investigations which are in progress or which have been completed. In this way he thinks the professor will gain a more accurate knowledge of what the student has done that his suggestions will be more adequate to the case, and that the student will acquire a broader view of the problem in his own hands, and a more systematic method of dealing with it.

One further provision in connection with this part of the laboratory is worthy of note. Physical chemistry involves a good deal of theory, and Ostwald has observed, doubtless, as the result of wide experience, that it gives rise to considerable discussion, especially on the part of beginners. Such discussions, even when purely scientific, naturally interfere also with those who are not taking part in them. He has provided a place in which these discussions can be carried on. The corridor is fitted up with black-boards, crayon and sponges. When the controversy becomes warm, the contestants can retire to the corridor, near the door, where it is cool, and here settle their differences in the most approved scientific manner. The gain to be derived to pure science from this provision may be considerable, especially in that men who are really working will not be disturbed by those who are simply talking.

The second story is a well equipped general chemical laboratory and scarcely calls for special comment. They are prepared in the new, as in the old, chemical laboratory, to give a student a general training in chemistry, which is absolutely essential to a subsequent career in physical chemistry.

The new laboratory was opened on January 3, 1898. There were present all the more prominent physical chemists of Germany and a number from outside: Van't Hoff, Arrhenius, Landolt, Beckmann, Waage, Nernst, Le Blanc, Elbs, Walden, Küster, and others. In addition to the physical chemists, there were those whose names are household words in other fields of natural science. Wislicenus, Wiedemann, Pfeffer, Engelmann, Flechsig, Zincke, Dorn, Knorr, and a number of the Leipsic faculty in more remote fields. Ostwald greeted his guests collectively and a number of them individually, and thanked most heartily, those who had made the new laboratory possible, and his assistants who had aided him in equipping it. He expressed the wish that "the spirit of brotherly frankness and the inspiring love of work, which accomplished so much in the old laboratory should remain true to the new. *Without this ethical content our work would be as sounding brass or a tinkling cymbal*," and then gave way to Beckmann.

During the past year a circular letter was sent to all who had worked with Ostwald in the old laboratory, inviting them to contribute to a fund which would be used to secure a bust or portrait of their Teacher. This was to be presented to him at the opening of the new laboratory, as a token of the esteem in which he is held by those who know him best. This met with the heartiest response, and made it possible not only to secure a bust, but also a number of reliefs for the laboratory, of such men as *Scheele*, *Berthollet*, *Berzelius*, *Faraday*, *Liebig* and *Bunsen*.

Beckmann made a short address, in which he expressed the love and esteem felt for Ostwald by all who have worked under his guidance, and presented a sketch of him from the hand of the Leipsic artist Seffners, which is to be placed in Ostwald's home. This was received with that frank-

ness and humility which are so characteristic of the master; and this now brings us to the most important event of the day—the formal address of Ostwald.

The speaker did not think it desirable to take up a special topic in physical chemistry, because a number of those present were in other fields, and would scarcely have followed him. He, therefore, chose a more general subject, which touches all branches of science, and in which all must be interested—*The problem of time.* This problem is discussed at first philosophically, and then its direct bearing upon physical chemistry is pointed out. Newton regarded time as objective, and distinguished in his *Principia* between absolute and relative time, regarding the latter as being contained in the former. Kant took the opposite view, that time as well as space is subjective. But this idea did not exert its influence on the natural sciences until about the middle of this century. The experimental development of the physiology of sensation brought out the subjective nature of sense impressions so clearly that the importance of Kant's suggestion began to be felt. We must not regard our conception of time as complete, but recognize that it is affected by the physiological conditions of our existence. I regard time as the *most general natural law.* Natural laws have this characteristic: They allow the infinite variety of possibility to be reduced to a special case, or to special cases of reality, and their significance is the greater the more numerous and manifold the phenomena to which the reduction finds application. In this sense time is a natural law. The conception of time expresses relations which are repeated in very widely different phenomena.

Ostwald then proceeds to analyze our conception of time, and finds in it the following four elements:

First, continuity. Time moves on without interruption. During sleep we cannot recognize time, and should be led to conclude that it had been interrupted. But the consideration of the objective world, which has progressed during our sleep, shows that the discontinuity of time is only apparent, and that it has really progressed without interruption.

Second, the linear nature of time. Time is a constant magnitude of such a nature that it is possible to pass from one definite value to another, only *in one way.* This is the same as to designate time as having one dimension.

Third, time never returns to a point or value which has been once passed, and is thus to be distinguished from a line with which it has much in common, since a line can be easily so drawn that it will cut itself.

Fourth, time moves on in one definite order. This is absolute, and a given succession in time cannot be reversed.

After inquiring into the origin of our conception of these four elements into which time has been analyzed, the speaker then considered the bearing of this discussion upon physical chemistry. A very important chapter in physical chemistry is that which deals with the *velocity of reactions.* A solution of this problem would not only complete a chapter of the science, but would throw light upon the most fundamental questions of psychology, and consequently of philosophy.

The chemist Wenzel furnished the foundation, more than a hundred years ago, for the law which obtains for reaction velocity—that under the same conditions, the velocity is proportional to the concentration of the reacting substance. More careful investigation showed that reaction velocity depends upon the nature of the reacting substances, their concentration and temperature, and other conditions which influence it, entirely out of proportion to the apparent magnitude of the

cause which is operating. A very small amount of a foreign substance, which apparently did not enter into the reaction, was found to be capable of increasing the velocity of a reaction to a very great extent. Examples of such reactions have long been known; indeed, the transformation of starch into sugar by boiling with acids, has been known for more than a century. Such action on the part of a foreign substance was termed by Mitscherlich and by Berzelius 'catalytic.' Such effects have recently been classed under the general head of *changes in the reaction velocity.*

Two experiments were then performed illustrating both acceleration and retardation of reaction velocity. If to a dilute solution of potassium iodide an equivalent of potassium bromate and acetic acid is added, free iodine will separate very slowly, and this can be made visible by the presence of a little starch. If a drop of a solution of potassium bichromate or ferrous sulphate is added, the solution becomes blue in a few moments, showing an acceleration in the velocity of the reaction. The bichromate does not act as an oxidizing agent under these conditions, as can be shown by removing the iodine by means of sodium thiosulphate, when the solution will have the yellow color of the unreduced bichromate. Further, ferrous sulphate, which produces the same reaction, is a strong reducing agent.

The retardation of the velocity of reaction was shown as follows: When an acid is added to a dilute solution of sodium thiosulphate the solution becomes cloudy, after a time. The addition of sulphurous acid causes the solution to remain clear for a much longer time. This is probably not catalysis in the strict sense, but the action of mass. Yet there are cases known where the retardation is undoubtedly a catalytic action, but these are less suitable for the purpose of demonstration.

We have, then, in small amounts of catalyzers, a means of increasing or diminishing the velocity of reactions a thousand or a million times. Says Ostwald: "I should like to express my conviction that it is difficult to overestimate the importance of this for organic life."

But what may be the technical significance of catalytic action? To increase the velocity of machines a proportionally larger amount of work must be done. An express train carrying the same weight as a freight, but moving with greater velocity, will consume more coal in traveling the same distance. A galvanic cell will work more economically the smaller the strength of current. Also in the other technical fields *velocity is secured at the expense of energy.*

Only in chemcal processes is this avoided. The addition of a small amount of a catalyzer, which is not used up in the reaction, may enormously increase the velocity of a reaction.

The significance of this for the industries becomes apparent, when we consider how important is the element of time in carrying out technical processes. Could a catalyzer be found for such processes a factory using the same amount of machinery or apparatus could increase its productivity many fold, and thus save interest on capital invested; or a train could greatly increase its velocity with the same consumption of coal.

As a matter of fact, catalyzers have long been used in some of the industries, such as the manufacture of sulphuric acid, dyeing, bleaching, etc. But up to the present this has been purely empirical, and frequently the rôle played by the catalyzer has not been recognized. The intelligent application of catalytic processes to the industries has recently been begun, and this is entirely due to the scientific study of such processes.

"I regard the field of catalytic phenom-

ena as the one in which the next important advances in general chemistry will be made," says Ostwald, who concluded his address thus, the aim of physical chemistry is to discover relations between the different branches of science and, instead of increasing the gap between them, to be an important factor in effecting their union.

In the afternoon a banquet was given to those present and in the evening the students held a 'Kommers.'

Thus was opened the finest laboratory for physical chemistry now in existence, it being the fourth in Germany alone. That of Landolt, in Berlin, is the oldest, while the laboratories of van't Hoff, in Berlin, and Nernst, in Göttingen, have scarcely two years of history. When we consider these facts, and, in addition, the number of places in which physical chemical investigations are in progress, especially in other laboratories in Germany, in France, Russia, Scandinavia, Austria, Japan, Holland, Great Britain, and America, we recognize that this branch of science has taken its place among the more important natural sciences.

And when we consider, further, that work of the character of that which is described as belonging to the 'Leipsic school' has been in progress for only a little more than a decade of years, we are impressed by what has already been accomplished, especially in the way of generalization.

It is to Ostwald that we are indebted for the *Zeitschrift* in which investigations could be published; for the experimental verification of the most important theories, and for the systematic presentation of the facts, in his monumental work —the *Lehrbuch*.

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*WIRELESS TELEGRAPHY.**

DURING the last few months the Solent has been the scene of some interesting experiments in wireless telegraphy. Under the direction of Signor Marconi two stations have been fitted up—one in Bournemouth, just opposite the end of the pier, and the other at Alum Bay, in the Isle of Wight—and between these places, which are 14½ miles apart, regular communication has been maintained without the use of any intervening connecting wires. On occasion an even greater distance has been traversed, for with portable instruments temporarily set up on the cliffs at Swanage it has been found possible to speak with the station at Alum Bay—nearly 18 miles away. But Signor Marconi does not believe that this represents anything like the limits up to which his apparatus can be worked, and he is now making the necessary arrangements for exchanging signals with Cherbourg, a distance of some 60 miles.

The instruments employed at Bournemouth and at Alum Bay are alike in all essential respects. The only outward sign at either place is a tall mast, some 120 feet high, from which depends a metallic conductor. Sometimes this is a simple wire; at others a narrow strip of ordinary wire netting has been tried as affording more electrical capacity, but there does not appear to be any great difference in the results. Inside the stations the first piece of apparatus that catches the eye is an induction coil capable of giving a spark 8 or 10 inches long. This with an appropriate battery and a key to control the current constitutes the sending instrument. The discharge from the coil passes between two brass balls about 1½ inches apart, thus giving rise to electro-magnetic waves which are radiated in all directions. One of the balls is connected with the external conductor already mentioned, the other is put to earth. Some

* From the London *Times*.

experimenters have employed a series of balls immersed in oil to generate the waves, but Marconi's experience is that the simpler arrangement he now employs is just as efficient. The receiving instruments consist of a coherer, a relay and a Morse printer. The coherer, the function of which is to detect the presence of the electric waves that travel through space from the sending station, is a short piece of glass tubing into which are sealed two silver pole-pieces. Between these there is a narrow space containing silver and nickel filings, and the whole is exhausted of air, not because a vacuum directly favors the sensitiveness of the instrument, but to prevent oxidation of the filings, which, of course, impairs their conductivity. These pole-pieces are included in an electrical circuit with the relay and a single cell, and in addition one of them is connected with the external conductor and the other with the earth. Normally the coherer does not conduct a current. But, by virtue of some action which is not yet fully understood, under the influence of an electric wave this condition is altered and a current enabled to pass through the filings between the pole-pieces. The armature of the relay is then attracted and the Morse printer or other suitable receiving instrument brought into action.

Thus the signal is begun, but it has also to be ended if the system is to be of practical use. The conductivity of the coherer does not, as might perhaps be expected at first sight, cease with the cessation of the electric wave that established it, but persists indefinitely so long as the instrument is not disturbed. The least mechanical shock or vibration, however, is sufficient to destroy it and to bring the coherer back to its original non-conducting condition. Hence Marconi provides on the relay circuit an electrical tapper, which by keeping the coherer in a state of constant vibration breaks down its conductivity as soon as it is established. The method of working is therefore as follows: If the operator at Bournemouth wishes to send a message to Alum Bay he connects his outside conductor with his induction coil, at the same time disconnecting it from the coherer. Then by means of the key he puts his coil into operation for long and short periods corresponding to the dashes and dots of the Morse code, thus exciting in the outside conductor groups of electric waves. Some of these fall upon the outside conductor at Alum Bay and convert the coherer there into a conductor; the relay circuit is immediately closed and the Morse instrument begins to print. Of course, during the transmission of one dash the circuit of the coherer is made and broken many times, but the printing instrument treats the quick succession of short currents as a single long one. The rate at which messages are sent in this way is not very great, but it is only fair to say that no efforts have been made to attain speed. The intention has rather been to demonstrate that signals can be sent with accuracy and certainty over a considerable distance without conducting wires.

A number of experiments have also been carried out between Alum Bay and a ship cruising about between the Isle of Wight and Swanage. In every case communication was easily maintained, whether the ship was moving forwards or backwards or swinging round. Nor was the working of the apparatus adversely affected by bad weather. On the contrary, it seemed to act most freely in fog, rain or wind, and was at its work on fine, clear, still days. These facts suggest that an early practical application of wireless telegraphy might be advantageously found in the establishment of communication between the shore and outlying lighthouses and light ships. No really satisfactory way of attaining this desirable end has so far been devised, and seeing that wireless telegraphy can be perfectly well

carried on in the climatic conditions which render other modes of communication difficult, if not impossible, the experiment is surely worth trying.

Other possible applications of this system of telegraphy might be enumerated, but it can scarcely hope to come into general use until one difficulty at least has been overcome, that is, to ensure that a message is received by the person to whom it is sent and by no other. Electric waves are thrown off in all directions from their generator, so that if a man sets up a station all his messages can be read by any one who cares to put up a precisely similar station within the limits to which the waves travel. Two principles may be employed to remove or lessen this inconvenience. Electric waves, like light waves, can be reflected and intercepted; hence a station could prevent the emission of waves in every direction but the one in which lay the station with which it wished to communicate, and thus reduce the possible eavesdroppers to those lying on the line along which the waves were directed. The other principle is that of syntony. Just as one tuning fork will vibrate in sympathy with another provided they are in tune with each other, and not otherwise, so one electric circuit will respond to the oscillations taking place in another, if they are in tune, but will be unaffected if they are not. Two stations therefore cannot telegraph across space to each other unless their apparatus is syntonized; hence by adopting differences of tuning a certain degree of secrecy may be arranged for. It remains to be seen whether the application of these two principles will suffice to provide a solution of the problem.

CURRENT NOTES ON METEOROLOGY.

PHYSIOLOGICAL EFFECTS OF HUMIDITY.

RUBNER and Von Lewaschew have recently been conducting laboratory experiments with a view to determining the effects of different degrees of atmospheric temperature and humidity on the human body (*Archiv. f. Hygiene*, Vol. XXIX). The individual on whom the experiments were made was placed in a closed chamber, into which air of varying known degrees of humidity was admitted. The separate tests lasted from four to eight hours each, and one hour before every test the same breakfast was eaten, while no food or drink was taken during the experiment. The body and the clothing were weighed before and after each trial, so that the amount of moisture given off or absorbed might be known. It was found that at low temperatures (57°–59°) dry air is pleasanter than moist; between 75° and 84° dry air seems cooler than moist when the change is made from one to the other. The last-named temperatures are easily borne if the air is dry. Visible perspiration was first noted at 84.2° and 22% relative humidity. Moist air (96% rel. humid.) made the temperature of 75.2° unbearable for a long time, and the experiment was possible only when there was no muscular movement whatever. At this temperature and humidity there was no considerable perspiration, although thirst was felt. Respiration decreased in dry air and increased in moist air. These experiments are interesting, but they do not give us the actual conditions that prevail in the outside air, as usually experienced by the human body. The movement of the air, which is a very important factor in its effects on the sensible temperature, and the varying amounts of heat lost by conduction, radiation and evaporation, according to the temperature and proximity of surrounding objects, are controls which do not come into play in the laboratory.

ELECTRIC SEARCH LIGHTS AS WEATHER SIGNALS.

THE *Monthly Weather Review* for February contains a note on the use of electric search

lights for the purpose of disseminating weather forecasts. The search light of the U. S. S. *Maine*, which was at the time nearly completed, was, in February, 1895, loaned by the Navy Department to the Weather Bureau for temporary use in Chicago, in experiments designed to test the efficiency of such a means of distributing warnings of coming important weather changes. The light, which had a lens 30 inches in diameter and whose candle power was estimated at about 100,000, was erected on the roof of the Auditorium Building, in Chicago, at an elevation of 270 feet above the level of the street. It was used but once, on February 28, 1895, in giving a warning of a coming cold wave, the light being slowly revolved at the rate of one revolution in five minutes. The night was dark and cloudy, and the signal was seen at a distance of 20 miles. A number of experimental trials were also made, and it was concluded that search lights are not useful for the purpose of disseminating forecasts except under the most favorable circumstances. The compiler of these *Notes* recalls that a number of years ago a similar attempt was made during one summer to flash weather forecasts from the summit of Mt. Washington, in New Hampshire (6,279 feet). This was a private enterprise, in the nature of an advertisement, but was fairly successful as far as the distribution of the forecasts was concerned.

CIVIL SERVICE EXAMINATIONS FOR POSITIONS IN THE WEATHER BUREAU.

It is pleasant to learn, from a note by Professor Abbe in the *Monthly Weather Review* for February, something of the Civil Service Examinations set for candidates for positions in the Weather Bureau. Since 1893 all the positions, except those of Chief and Assistant Chief, have been in the classified service, and therefore a special system of examinations has been arranged. The examination for the position of Observer in the Weather Bureau embraces the following subjects, besides spelling, arithmetic, etc., with the respective weights as given, viz., practical questions in meteorology, 40; an essay on a practical subject in meteorology, 20; geography of the United States, 10, the total number of points being 100.

FALSE DEW.

Aitken's theory that much of what is ordinarily called dew does not come from the water vapor in the air, but from within the plants on which moisture is seen, has received further experimental confirmation at the University of Nebraska, where Professor C. E. Bessey has been carrying on investigations along the lines suggested by Aitken's own observations (*Monthly Weather Review*, March). These studies show that, when the soil is moist and warm, the leaves of plants exude water, which forms in drops on the plants when evaporation from the leaves is checked by the cooling and the consequent increase in the humidity of the air. In cases of unusually active plants, drops may be forced out in dry, warm air. These drops form what is known as 'false dew,' and the process is known as 'guttation.'

NOTES.

From the *Meteorologische Zeitschrift* for April we learn that a bibliography of Italian meteorology is being prepared by the librarian of the Observatory of Moncalieri, near Turin, the list to include all books, pamphlets and articles bearing on meteorology which have been published in Italian.

Among noteworthy recent articles is the following: J. Hann: *Ueber die Reduktion kürzerer Reihen von Niederschlagsmessungen auf die langjährige Reihe einer Nachbarstation.* Met. Zeitschr., Apr., 1898, 121–133.

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CURRENT NOTES ON ANTHROPOLOGY.

LANGUAGES OF HONDURAS.

THE Spanish spoken in Central America has been examined by various writers, notably Ferraz, Berendt and Barbarena. On that which prevails in Honduras a careful study has lately appeared from the pen of Alberto Membreño. It is a well printed volume of 270 pages. Many of the words quoted as peculiar are derived from the native dialects. The author, therefore, has collected, in an appendix of 75 pages, a number of vocabularies and grammatical notices of these idioms. They are seven in number, to wit, the Moreno, Zambo, Sumo, Paya, Jicaque, Lenco and Chorti. He prefaces these with a brief sketch of the present condition of the native tribes in the republic. The ethnographic value of the volume is considerable ('Hondureñismos,' Tegucigalpa, 1897).

THE RUINS OF MEXICO.

IN the *Archiv für Ethnographie* for January there is a description of the ruins of the native city Mixco, in Guatemala, by Dr. Carl Sapper. This was one of the ancient strongholds destroyed by Alvarado in 1525. There has been some uncertainty as to what branch of the great Maya stock inhabited it, but it would appear to have been the chief city of the Pokomams or their near relatives.

In Dr. Sapper's article he introduces a ground plan with elevations of the fortress and town, adding detailed illustrations of several of the ruins, in part restored. While exhibiting some peculiarities of architecture, a general comparison with other remains of the Mayas permits us to class it with the relics of that cultured people. Dr. Sapper remarks that the ruins in northwestern Honduras are purely Mayan in type and in details.

ETHNOGRAPHY OF CUBA.

IN connection with our present contest concerning Cuba it may be worth while to note that a Spanish professor, Dr. Vidal y Careta, printed last year an article of some length in the scientific periodical *La Naturaleza*, No. 8, on the different races who have successively occupied that island or migrated to it within the historic period. He begins by calling the aboriginal stock 'Caribs.' In this point it may be asked whether he is not in a popular error. There appears no evidence that the great Carib stock of South America ever established permanent settlements anywhere in Cuba, although they undoubtedly made predatory incursions against its inhabitants. These certainly belonged to the Arawack stock of the south. In reference to later time Professor Vidal offers less which can be criticised.

D. G. BRINTON.
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ASTROPHYSICAL NOTES.

FROM the measurement of 234 out of 400 solar photographs taken from 1891 to 1894 by several Russian observers, Stratonoff, of Taschkent, has recently contributed, in the Memoirs of the St. Petersburg Academy, a valuable study of the movements of the solar faculæ. The principal difficulty in such work is in identifying the faculæ on successive days. 103 faculæ were observed on two days, and 5 on three days. The methods of reduction are given in full, and the accuracy of the measures is indicated by the full data for four plates. A list is given of 1062 faculæ for which the angle of daily rotation was determined. In the zone of solar latitude 0° to 10° the angle was found to be 14°.6, and in the zone 30° to 40°, 13°.6, with probable errors less than 0°.1.

The conclusion is reached that the faculæ move at distinctly different angular rates in different solar latitudes, but under a more complicated law than in case of spots. The

period of a solar rotation at the equator as determined from the faculæ is 24.64 days. The order of rapidity of rotation is faculæ, then spots, and last the stratum in which the dark lines are produced which were used by Dunér in his spectroscopic determination of the solar rotation.

The first volume of the Publications of the Zurich Observatory has appeared, aided by a publication fund bequeathed by the late Director, Professor Rudolph Wolf. It contains the observations by Professor Wolfer, now Director, on the solar surface in the years 1887–89. The introduction of photographic methods has not detracted from the value of systematic visual observations of solar phenomena. At Zurich these observations have long been a specialty. Spots, faculæ and prominences are included in the observations, which are given in detail with location in heliographic latitude and longitude, followed by charts graphically indicating the distribution. It seems that the faculæ in the years 1887–89 had a tendency to develop in two special regions of solar longitude nearly diametrically opposite to each other. In a less degree this is shown by the spots, and somewhat by the prominences. The Publication is handsomely printed.

E. B. F.

NOTES ON INORGANIC CHEMISTRY.

Manganese salts in which the metal is trivalent are known, but they are few in number, and all are decomposed by contact with water. In the last *Journal of the Chemical Society*, C. E. Rice describes two double manganic chlorids, $MnCl_3.2NH_4Cl.H_2O$ and $MnCl_3.2KCl.H_2O$, which are stable up to the temperature of 100°. They are formed by dissolving the higher oxids of manganese in fuming hydrochloric acid, immersed in a freezing mixture and adding a solution of ammonium or potassium chlorid. The compounds form minute transparent crystals transmitting ruby-colored light. They dissolve in hydrochloric acid to a dark solution, but are decomposed by water. The analogy of manganese to iron is shown by the fact that the crystals are apparently isomorphous with $FeCl_3.2NH_4Cl.H_2O$ and $FeCl_3.2KCl.H_2O$. The chlorid $MnCl_3$ could not be isolated, and there was no evidence of the formation of any $MnCl_4$.

The last number of the *Chemical News* reprints an article from the *Proceedings* of the Australasian Association for the Advancement of Science, by Professor Liversidge, of the University of Sydney, on the corrosion of aluminum. Two shallow dishes of ordinary sheet aluminum 1 mm. thick were exposed on the laboratory roof for over a year. Rain water caught in the dishes so that they were exposed to the action of any dissolved salts of the atmosphere. The metal soon lost its brilliancy, became gray and rough, and the incrustation did not wash off and could not be rubbed off by a cloth. The dishes increased in weight somewhat less than one per cent. The tarnish was probably due to the formation of a hydrated oxid of aluminum. The tarnish must be comparatively superficial considering the small increase in weight in over a year's exposure. It is, however, clear that the statement frequently found in books that aluminum is unaltered by exposure to the air is not true of the commercial metal, whatever may be the case with the chemically pure metal. In another experiment by Professor Liversidge a sheet of aluminum 1 mm. thick and of 24 square inches' surface was dipped in a solution of salt almost daily for three months, each time being allowed to dry. The plate lost 0.1% in weight, and after washing and rubbing dry 0.3%, showing comparatively little corrosion.

J. L. H.

SCIENTIFIC NOTES AND NEWS.

LORD PLAYFAIR.

BARON LYON PLAYFAIR, the eminent chemist and statesman, died in London on May 29th. We take the following facts regarding his life from the New York *Evening Post:* He was a son of George Playfair, Chief Inspector-General of Bengal Hospitals, and was born at Meerut, Bengal, on May 21, 1819. He was educated at the University of St. Andrew's, and at an early age took an especial interest in chemistry. After studying the science at Glasgow and Giessen he was appointed, in 1843, professor of chemistry in the Royal Institution at Manchester. In the following year he was appointed on the commission constituted to examine into the sanitary condition of the large towns and populous districts of England. He was then appointed chemist to the Museum of Practical Geology. In the great exhibitions of 1851 and 1872 he was Special Commissioner in charge of the Department of Juries. He was chairman of the finance committee of the English Commission at the French exhibition of 1878. Meanwhile, in 1856, he became Inspector-General of Government Museums and Schools of Science, and in the following year was elected President of the Chemical Society of London. He became professor of chemistry, in 1858, at Edinburgh University. In conjunction with Sir Henry de la Beche, he examined, at the desire of the Admiralty, into the suitableness of the coals of the United Kingdom for the purposes of the navy, and into the causes of accidents in mines. He was one of the Royal Commissioners to inquire into the cattle plague on its appearance in England, and a member of the commission which laid the basis for the withdrawal of legislative restrictions on sea fisheries. In 1874 he was President of the Civil Service Inquiry Commission, which produced an elaborate scheme for the reorganization of the British civil service. He sat in Parliament for the Universities of Edinburgh and St. Andrew's from 1868 to 1885, and for Leeds from 1885 to 1892, at which time he was raised to the peerage of the United Kingdom. In the Liberal Ministry of 1873 and 1874 he was Postmaster-General. In Mr. Gladstone's government of 1886 he was Vice-President of the Council. He was a member of many learned societies, and held many British and foreign orders.

THE IMPERIAL INSTITUTE.

THE annual meeting of the governing body of the Imperial Institute, London, was held on May 4th. The Prince of Wales (President of the Institute) presided, and expressed his satisfaction, according to the report in the London *Times*, at the steady progress made in various branches of important work of the Institute, as detailed in the report, and with the reduction of expenditure which had been the result of careful revision of the executive of various branches of the Institute, and incidental expenses. He expressed the hope that members of the governing body would use their best endeavors to promote the proper recognition of the work which the Institute was carrying out by inducing people in different parts of the United Kingdom to become members.

The annual meeting of the Institute was afterwards held under the chairmanship of Lord Herschell. In the annual report, which was read to the meeting by the Hon. Secretary, it was shown, in considerable detail, that the fifth year of the Institute's operations had witnessed a steady expansion, as well as a distinct advance, in their establishment upon a firm footing. It was reported that a public commercial news-room, very completely equipped with commercial and official publications, had been opened in connection with the collections of the Institute, and that steps were in contemplation for establishing a City branch of the information department of the Institute, to which the public news-room would probably be transferred. The number of public lectures delivered during the winter season had been considerably increased. The exercise of rigid economy, and a careful revision of the details of administration, etc., were reported to have resulted in reductions of expenditure in almost every direction. There had been a considerable falling-off in the number of Fellows during the year, and there had been a somewhat heavy outlay in connection with the Yachting and Fisheries Exhibition. On the other hand, the exhibition of Jubilee presents had furnished a substantial addition to

the year's revenue, besides providing a large contribution to the Prince of Wales's Hospital Fund. The balance sheet presented by the auditors showed a debit balance of £365. Lord Herschell gave an interesting account of the important work which is now being carried out in the Intelligence and Scientific and Technical Departments, and brought before the meeting a number of weighty illustrations of the high appreciation of this work by mercantile houses, manufacturers and colonial authorities. He emphasized the fact that this work was in great part accomplished through the agency of Fellows' subscriptions, and urged that Fellows of the Institute should demonstrate their sympathy with the work by endeavoring to obtain additions to their number. The subject of the criticisms published on the engagement of foreign bands was also dealt with by him, and he concluded an eloquent address by a reference to the fact, now much lost sight of, that the Imperial Institute was founded, erected and established as a monument commemorative of the Queen's Jubilee of 1887.

TESTS OF SEEDS BY THE U. S. DEPARTMENT OF AGRICULTURE.

THE Department of Agriculture has issued a circular which gives a table fixing the standard for purity (freedom from weed seeds) and germination of high-grade seeds and the limit below which seeds are unfit for sale. The circular further says:

The Act of Congress making appropriations for the Department of Agriculture for the fiscal year ending June 30, 1899, under the heading 'Botanical Investigations and Experiments, Division of Botany,' contains the following clause:

The Secretary of Agriculture is hereby authorized to purchase samples of seeds in open market, test the same, and when found not up to standard he may, at his discretion, publish the results of these tests, together with the names of the seedmen by whom the seeds were sold.

The purchase of seeds for the tests authorized under this act will begin July 1, 1898.

The seed must be true to name, and practically free from smut, bunt, ergot, insects or their eggs or larvæ, and the seeds of dodder, wild mustard, wild flax, Russian thistle, Canada thistle (*Carduus arvensis*), cockle, chess (*Bromus secalinus*), quack grass, penny cress, wild oak and the bulblets of wild onion. It must not contain more than one per cent. of other weed seeds.

It will be the aim of the Department of Agriculture in carrying out this law to put a stop to the sale of seed so poor as to make probable a positive injury and loss to the purchaser, thus giving protection on the one hand to the farmer and gardener and on the other hand to the honorable seedsman and seed dealer.

The purchase and testing of the seeds will be carried on under the supervision of the Botanist of the Department, Frederick V. Coville, and in the immediate charge of Gilbert H. Hicks, Assistant.

Seeds showing a test as high as these standards are considered of high grade. Seeds falling five points below the standard in purity, or containing an appreciable amount of the prohibited seeds or more than one per cent. of other weed seeds, or falling twenty points below the maximum percentage in germination are, in general, considered unfit for sale as first class seed, and if sold as such the results of the tests are liable to publication. Furthermore, if seeds sold as of lower grade are found to contain a large amount of weed seeds or show a very low germination, so as to render them practically valueless or seriously injurious, the results of these tests also are liable to publication. It is recognized, however, that in certain cases, as in highly bred varieties or growth and harvest under unfavorable seasonal conditions, seeds may show a germination lower than the normal, and due allowance will be made.

GENERAL.

THE Committee on Education of the Massachusetts House of Representatives has reported a bill appropriating $2,500 in aid of the Boston meeting of the American Association for the Advancement of Science.

MR. GIFFORD PINCHOT has been appointed Chief of the Division of Forestry, Department of Agriculture, to fill the vacancy caused by the resignation of Mr. B. E. Fernow to accept the Directorship of the New York State College of Forestry. Cornell University.

PROFESSOR IRA REMSEN has been elected an honorary member of the Pharmaceutical Society of Great Britain.

DR. W. H. DALL has been elected a Foreign Correspondent of the British Geological Society.

PROFESSOR ROBERT KOCH has returned to Berlin after an absence of a year and a-half, which he has devoted to the study of infectious disease in Africa and India.

PROFESSOR GEORGE RÖRIG, of Königsberg, has been appointed head of the newly established division for agriculture and forestry under the Imperial Bureau of Health, Berlin.

DR. JOHN MURRAY, F.R.S., has been made a K.C.B. as one of Queen Victoria's birthday honors.

THE Royal Academy of Belgium has elected Professor Max Müller to fill the vacant place among the foreign members in the Class of Letters and Moral and Political Sciences.

CAMBRIDGE UNIVERSITY will confer the honorary LL.D. on Sir William Turner, F.R.S., and Mr. F. C. Penrose, F.R.S. The honorary M.A. will be conferred on Mr. Arthur Willey, Balfour student.

MR. C. E. EMERY, the well-known consulting engineer, formerly of the United States Coast and Geodetic Survey, died in Brooklyn, June 2d, at the age of sixty years. He was a Past President of the Society of Electrical Engineers and had received the Telford medal from the British Society of Civil Engineers.

WE regret to record the following deaths among men of science abroad: M. Souillart, professor of astronomy in the University of Lille, correspondent to the Paris Academy for the Section of Astronomy and known especially for his researches on the satellites of Jupiter; Mr. Edward Wilson, curator of the Bristol Museum and the author of valuable papers in geology, on May 21st, at the age of forty-nine years; Mr. W. C. Lucy, an English geologist, on May 11th, at the age of seventy-five years; Dr. C. Herbert Hurst, demonstrator in zoology in the Royal College of Science, Dublin, and the author of valuable contributions to zoology, and Dr. Gustav Reichsritter von Wiedersperg, a prominent Austrian sanitarian, aged fifty-nine.

AT the annual meeting of the National Geographic Society held on May 20th Messrs. Alexander Graham Bell, Henry Gannett, John Hyde, W J McGee, F. H. Newell and A. W. Greely were re-elected members of the Board of Managers. Several amendments were made to the By-laws, one of which reduces the number of Vice-Presidents from six to one. At the meeting of the Board of Managers on June 3d the following officers were elected: President, Alexander Graham Bell; Vice-President, W J McGee; Recording Secretary, F. H. Newell; Corresponding Secretary, Eliza Ruhamah Scidmore; Treasurer, Henry Gannett. The Society has arranged for several summer meetings. A field meeting will take place at Cabin John Bridge, and an indoor meeting in Washington, in connection with the annual meeting of the National Educational Association, which is this year to be held at the National capital. A meeting in Boston has been arranged also, to be held in connection with the meeting of the American Association for the Advancement of Science and the Geological Society of America. The date chosen is Thursday, August 25th.

THE Schweizerische naturforschende Gesellschaft will hold its 81st annual meeting at Berne on July 31st, August 1st, 2d and 3d, under the presidency of Professor Th. Studer. The meeting opens with an assembly on the evening of July 31st, followed by a general meeting and various entertainments on August 1st. August 3d is devoted to an excursion to Grindelwald. The scientific work of the sections is confined to August 2d, and in conjunction with them will meet the Swiss Geological, Botanical and Zoological Societies. Of the thirteen sections six are devoted to physiological, medical and agricultural sciences, which are entirely ignored by the American Association. American men of science would doubtless be repaid by arranging to be present at Berne on the first of August. They can obtain further information from the General Secretary, Professor J. H. Graf, Wyler Str., 10, Berne.

MR. BORCHGREVINK expects to leave London in July for explorations in South Victoria Land on a new ship, 'The Southern Cross,' designed by the builder of the 'Fram.'

COLUMBIA UNIVERSITY has sent a zoological expedition consisting of Mr. N. B. Harrington, fellow in zoology, and Mr. Reid Hunt, tutor in physiology, to the Guinea coast, Africa, to study the developmental stages of the Crossopterygian fishes. These are now looked upon as representing more nearly than any other recent fish-like animals the ancestors of the terrestrial vertebrates, and the investigation of their development is expected to throw light on many long disputed problems relating to the origin of the higher animals. The expedition has been made possible by a gift of $1,800 from Mr. Charles H. Senf.

THE Yale zoological expedition to Bermuda under the direction of Professor Verrill has recently returned with a large and valuable collection of specimens, illustrating mainly the marine fauna of the island.

PROFESSOR C. L. BRISTOL has left for Bermuda in company with Mr. J. Watson Vail. Professor Bristol will install the laboratory of the New York University, which will be well equipped for the special study of embryology by the time of the arrival of his students, who will sail on June 16th. On this, the second summer expedition, Professor Bristol and his students purpose making a further reconnaissance of the island, with a view to erecting a permanent station. In addition to other researches they will make experiments in submarine photography.

THE annual conference of State and Provincial Boards of Health of North America will meet at Detroit on August 11th and 12th.

THE Bucks County Natural History Association, Pennsylvania, held its annual meeting on June 2d. An address upon the work of the Association was made by Mr. Nathaniel Richardson, the President, and the program included a paper on petroleum by Professor Hart, of Lafayette College.

THE fifth International Congress of Hydrology, Climatology and Geology will be opened at Liège on September 25th next.

THE bill appropriating $10,000 for the extermination of the brown-tail moth in Massachusetts has been passed, with the important exception that it was amended by striking out the appropriation of $10,000 and providing that all expense connected with the work should come out of the appropriation for exterminating the gypsy moth. The Board of Agriculture is given charge of the work.

THE United States Civil Service Commission announces that on June 27, 1898, examination may be taken for the grade of Nautical Expert, Navy Department, Hydrographic Office. There is at present a vacancy in this grade at the Hydrographic Office at Washington at a salary of $1,000 per annum and another at the branch Hydrographic Office, New York City at a salary of $1,400, which it is desired to fill. The examination will consist of the following named subjects, which will be weighted as follows:

Letter-writing,	1
Pure mathematics,	3
Physical geography,	2
Nautical definitions,	1
Navigation,	2
	10

THE first meeting of the State Trustees of Scenic and Historic Places and Objects, under their new corporate name of 'The Society for the Preservation of Scenic and Historic Places and Objects,' was held in New York on May 31st. The following governing board of trustees was elected; Andrew H. Green, Frederick W. Devoe, Samuel Parsons, Jr., Henry E. Howland, Walter S. Logan, Edward P. Hatch and Edward Hagaman Hall, of New York, and Charles S. Francis, of Troy. Mr. Green was elected President, Mr. Francis Vice-President, Mr. Hatch Treasurer, and Mr. Hall Secretary.

THE Council of the British Medical Association are prepared to receive applications for grants in aid of researches for the advancement of medicine and the allied sciences. Applications must be made to the General Secretary, at the office of the Association, 429 Strand, W. C., and must include details of a precise character and objects of the research which is proposed. The Council are also prepared to receive application for one of the three Research Scholarships, which is of the value of £150 per annum, tenable for one year, and subject to renewal by the Council for another year.

THE managers of the Pennsylvania Hospital in Philadelphia have taken steps to add to the institution a clinical laboratory, the funds being provided by a bequest of $50,000 by the late Josephine M. Ayer, of Philadelphia, supplemented by a gift of $25,000 from her son, Fred. F. Ayer.

UNIVERSITY AND EDUCATIONAL NEWS.

THE New York University Medical College and the Bellevue Medical College will be consolidated under the name 'The University and the Bellevue Hospital Medical College.' It will be remembered that the negotiations for this union failed a year ago at the last moment, but the resignation of a portion of the faculty of the New York University Medical College to form a new school under the auspices of Cornell University has now led to the consolidation.

THE Trustees of Colby University have made a contract for the construction of a chemical laboratory to be built of stone and brick and to cost $30,000.

THE will of the late Felix R. Bonnet, of Pittsburg, Pa., provides that, upon the death of his widow, $300,000 shall go to the Western Pennsylvania University for the endowment of scholarships.

PRESIDENT F. P. GRAVES, of the University of Wyoming, has been elected President of the University of Washington.

THE following promotions and appointments have been made by the corporation of Yale University: Assistant Professor Sneath was promoted to a full professorship of philosophy in the College; Dr. Philip E. Browning, promoted from an instructorship to an assistant professorship in chemistry; Dr. E. W. Scripture was given the title of director of the psychological laboratory; E. M. Weier, B.A., 1895, was appointed assistant in the same laboratory; George Grant McCurdy, B.A., Harvard, 1893, was appointed to a new instructorship in prehistoric anthropology in the Graduate School; H. E. Gregory, B.A., 1896, instructor in physical geography.

THE University of Dublin has elected to the chair of mental and moral philosophy Mr. Swift Paine Johnston, who is said to be an American citizen.

MR. H. YALE OLDHAM has been appointed reader in geography in Cambridge University.

DISCUSSION AND CORRESPONDENCE.

'A PRECISE CRITERION OF SPECIES.'

TO THE EDITOR OF SCIENCE: In the issue of this JOURNAL for May 20, 1898 (N. S. vii., No. 177) is a joint contribution, under the above title, by Messrs. C. B. Davenport and J. W. Blankinship, in which Mr. Davenport, under the subheading '*A.* The General Method,' says: "What is needed is a method of precisely defining the degree of isolation and the degree of divergence necessary for distinct species." To establish such a method, and to define 'the degree of isolation and the degree of divergence necessary for distinct species,' is the grand task here undertaken—and accomplished, to the satisfaction apparently of, at least, the author of the paper; and his diagrams of curves and his mathematical formulæ are very interesting and very suggestive, so far as they go. But the conclusions based thereon, and the methods by which they are reached, display an extraordinary lack of practical experience with the actual conditions of the problem in hand. No one duly appreciating the conditions to be met would ever undertake to formulate a 'method' on such imperfect data as he has employed for the 'Determination of the Line between Species and Varieties,' since their utter insufficiency is obvious, one would suppose, to any one at all experienced in this field of research.

"The question arises," says Mr. Davenport, "whether it would not be necessary to draw curves for many characters." He answers: "Practically it will not be necessary, for confluent species are usually separated chiefly by one most distinctive character." Unfortunately, this is not the case, but by a combination of slight differences along a number of distinct lines. But suppose it were as Mr. Davenport assumes, and the most distinctive character was one of color, involving not only the prevailing tint, but coincidently variations in

the markings of particular parts or areas. Generally, it is not only this, but color differences combined with variations either in general size or in the size of special parts or organs, in which the variations of different parts are sometimes in opposite directions. If the author had worked directly from large series of specimens, instead of taking data tabulated by others relating to the single character of size, it is pretty safe to say that the paper here under notice would not have been written.

In the case of *Zapus* there is no reason for doubt in respect to the status of the two forms. They present as clear and well pronounced evidence of specific distinctness as could well be looked for between congeneric forms. In the case of *Scalops* the curves of differentiation are based on the single character of general size, the length of the skull being taken as the basis. Other characters of perhaps equal or even greater importance, as the increase in the size of the teeth with decrease in skull length or in general size, the relative length of the tail and marked differences in color are ignored, perhaps because the differences in these features are not easily reducible to 'quantitative expressions.' But taking size alone, what kind of a 'method' is it that attempts to determine quantitative difference, say between *Scalops aquaticus* from Massachusetts, Connecticut and New York and *Scalops machrinus* from Minnesota, Illinois and Iowa by taking in the first case a few specimens at irregular and infrequent intervals from Cape Cod to Charleston, S. C., and in the other in a similar way from Minnesota to Louisiana? In either case the difference in size is greater between specimens from the northern and the southern points in either series than between specimens from corresponding points in latitude between *S. aquaticus* and *S. machrinus!* Mr. Davenport's Fig. 8 thus shows nothing of any value whatever. The quantitative study of variation is a problem of great interest and importance, but this is not the way to go about it. The ideal way, and one which would be profitable in results, would be to take a sufficiently large series of adult specimens, say in the case of *Scalops* of not less than 20 to 50 from judiciously selected localities not more than 100 miles apart, along at least two lines, the one meridianal, the other on a parallel of latitude (due regard in each case being had for differences of elevation), and subject each available character to quantitative analysis. Were this done on a series of such intersecting lines extending throughout the ranges of all the forms of a genus the results might then be expressed in curves that would reflect actual facts and throw important light on the status and real relationships of all the forms involved. It might be well worth doing, at least in the case of a few groups, for the general bearing such results would have on the problems of evolution; but the millenium of a precise knowledge of species and subspecies for any class of animals—say of North American mammals—will not arrive in our day if we must wait for the production of that delightful result by the process of quantitative determination of character variation. The work and expense involved is too great, and long before final results would be available the methods now in vogue of studying comparatively large series from as many localities as possible will probably have already covered and decided most of the points such an elaborate system might be properly expected to establish.

J. A. Allen.

A NECESSARY CORRECTION.

To the Editor of Science: In an article claiming to be a review of 'The Living Substance' (Supplement to *Journal of Morphology*), which appeared in *Nature* recently, the reviewer, F. A. D., says: "*The authoress of this wordy treatise informs us (p. 173) that she started from a neutral position with regard to Bütschli's vesicular theory, or even with a bias against it. Now, however, having become the most ardent of converts, she proceeds, with the proverbial zeal of a proselyte, to carry the original doctrine to extremes. Not content with proclaiming the existence of foams undreamt of by Bütschli—'wheels within wheels' ad infinitum—she utters what amounts to a denunciation of all previous statements of biological fact and theory as misleading and inadequate, and urges in effect that the whole science of life needs recasting from the new point of view.*"

Now, Bütschli's famous vesicular theory of protoplasm argues for a physico-chemical interpretation of protoplasmic activities. Believing that he had discovered a fundamental vesicular structure, Bütschli held that amœboid movements, the phenomena of cell division, and even contractility, may be interpreted as results of osmotic interchanges, surface tensions and extension currents amongst the lifeless lamellæ of this structure. He admits, however, "I find myself unable * * to apply the same physical explanation to the finer formations, such as the free filose formations * *." Further, that "the morphological method, so fruitful in research amongst multicellular organisms, fails in our research into the essential nature of the elementary organism—the cell."

Compare the following from 'The Living Substance.'

(1) "The vital phenomena of protoplasm were seen to be not so much manifestations of the vesicular form of the substance, as upon, or through, this," p. 67. (2) "The co-existence of a stable and perfect structure of Bütschli, with a host of metamorphosing activities of the substance as such; this forms one of the strongest reasons I would urge for preferring optical research upon the living material," p. 68. (3) "It is the free filose formations, not amœboid flow, which I find to be most universal, most characteristic and most fundamental in the living substance," p. 78. (4) "It is then, not that compound of cells whose multiplication we have watched with such breathless interest that is the true organism, but the continuous substance, by whose local deposits of specific materials these cells and their nuclear machinery are built up * * * . And within the organism's limits, the protoplastic substance as such retains, one must now believe, all those protoplastic powers which are seen in free Heliozoa—all those tactile and selective and sensitively irritable, and contractile, functions that protoplasm exhibits when placed externally to cells, areas, or masses. On this protoplastic substance the race habit depends, and in it are rooted all other habits of organisms," p. 170. (5) "Organs no longer appear as compounds of certain different sorts of cells, but as a complex of minute substance organs," p. 151. (6) "The organism as we have known it, is secondary, incidental to the life-history of the protoplastic, continuous substance of the living being; is result, rather than cause, of substance habit," p. 171. (7) "We are not denied an ultimate return to purely physical interpretations * * * but we are bidden for the time to a physiological standpoint as more immediately fruitful," p. 119. Under Areal Differentiation, Striation and Activities, hundreds of radically new facts prove that any present application of physico-chemical explanations, by means of vesicular structure, to either contractility or cell division is not possible.

The rest of F. A. D's article bears out the beginning, is a crescendo of similar blunders and guesses—personal in tone, hysteric in timbre, and unsupported by a single quotation; but in view of the cardinal absurdity of wholly ignoring the text of the book 'criticised,' one's sense of humor vetoes further analysis.

G. F. ANDREWS.

SCIENTIFIC LITERATURE.

La face de la terre (Das Anlitz der Erde). EDOUARD SUESS. Translated from the German with the approval of the author and annotated under the direction of EMM. DE MARGERIE, with a preface by PROFESSOR MARCEL BERTRAND. Paris, Armand Colin et Cie. 1897. Vol. I. Pp. 835. With two maps in colors and 122 figures.

The first part of *Das Anlitz der Erde* appeared in 1895. The author set himself the task of marshalling the movements of the earth's crust into a system. The work gives the result of his studies of mountain systems and of the adjacent plateaus and plains. From its scope and the radical views of the author, the treatise takes a place in geological literature with the famous Notices sur les systems des montagnes of De Beaumont, published in 1852.

De Beaumont gave us, perhaps, the first clear statement of the contraction hypothesis in its relation to mountain building. In his treatise on mountains he sought to establish the principle that mountain chains of the same age are parallel to the same great circle. In attempting to defend his thesis, De Beaumont made

use of his own personal knowledge and when that gave out resorted to the bibliographic method of research. Suess had no small share in the recognition of the wonderful overthrust phenomena of the Alps. He thus came into possession of knowledge of earth movements which were still unperceived, except by a few individuals, in the time when De Beaumont wrote of the 'pentagonal network.' Following up his own investigations in the field about the eastern Mediterranean with a study of the literature, Suess worked out a system of movements in the earth's crust, which is, to say the least, possessed of the merit of novelty.

Suess has arranged his facts and the interpretations which he has placed upon them in a classification of crustal movements. He recognizes one group of movements which result from tangential pressure. In this category he places the overthrusts, or essentially horizontal movements on horizontal surfaces, and 'decrocheements,' or horizontal displacements along vertical planes. These movements he finds taking place in regions of folded rocks, such as the great mountain chains of Europe and Asia.

Suess makes a second group of dislocations, including effects due, as he thinks, solely to gravity. He states that everything in this group of dislocations behaves as if the parts of the earth's crust affected by them "fell under the influence of their own weight into large open cavities below, or as if the surface of the globe sank into a soft base yielding under pressure." It is in respect to this view that the conception of crustal deformation entertained by Suess is in most striking contrast to the generally received interpretation of faults coming in his second group. Where several fault blocks divide, for instance, a table-land, into masses standing at different levels with reference to each other, Suess postulates an invariable downward movement for the blocks which stand relatively low. He does not suppose that uplift has taken place in the case of the blocks which stand relatively high. To account for this falling-in of the crust, Suess postulates a radial force as one of the components of the force of contraction.

The present volume consists of a number of essays in which, in one way or another, the effects of these several dislocations of the crust are shown and traced with great detail. The opening chapter is a most entertaining discussion of the Deluge, a subject which geologists have, perhaps wisely, neglected since the time of that masterful romancer, Burnet, and his school. The story of the Deluge is told in the light of the Chaldean account of Genesis. An abstract of this chapter has already been presented to the readers of SCIENCE by Professor Emerson (see Vol. IV., 1896. pp. 335–344). Suffice it to state here that Suess finds an explanation of the disaster in the valley of the Euphrates in the conjunction of an earthquake and a cyclone. Many circumstances, as, for instance, the boat of Xithrusos being carried inland instead of out to sea, go to show, he thinks, the effects of a great marine invasion. He concludes that the "traditions of other people do not authorize us in any manner to suppose that the Deluge passed the limits of the lower basin of the Euphrates and of the Tigris, and still less to state that it extended over the whole earth." The legend appears to have been introduced by our author to show that some of the dislocations and falling-in of fault blocks in that part of Eurasia took place within the memory of man.

The chapter on earthquakes is an attempt to establish the existence of lines of fracture and earth movement, and incidentally to show that these movements are not of an elevatory kind. Admitting that there are earthquakes which have a local point of origin, there are other earthquakes, he states, which cannot be traced to one small place, but are due to the simultaneous movement of an extended portion of the earth's surface. He selects for discussion four areas in which shocks are held to be of a different character. These may be briefly summarized: 1st. The Alps of the Northeast, without volcanoes. In this region, near Vienna, shocks have been propagated at right angles to the chains of mountains, indicating horizontal movements on cross-fractures ('decrochements' or 'Blatten.') 2d. Southern Italy, with volcanoes, but these without alignment. Here there is a circular line of areas of earthquake shock passing from Calabria into Sicily and having the Lipari Isles at center. It is thought that within the area limited by the

periphery thus marked out the earth's crust sank, for instance in 1783, in the form of a basin, and at the same time there were developed radial cracks converging in the Lipari Isles. Near the center these lines are beset with points of eruption. The perennial and isolated volcanoes, such as Ætna, he thinks, are located on the crossing of these radial fractures with the peripheral line of faulting. 3rd. Central America, where earthquakes are frequent though not well studied, but where the disposition of volcanoes is held to indicate great fractures. These volcanoes may be placed in two groups, or alignments, which join at an obtuse angle in the Bay of Fonseca, between San Salvador and Nicaragua. The shifting of vents here is towards the Pacific Ocean. Suess thinks the fractures have opened downwards and that this region is sinking. 4th. The western coast of South America, made classical by the writings of Darwin. Darwin has been for half a century the authority for the belief that, during the earthquake of 1835, the western coast of South America was elevated at least nine feet. Suess's thesis leads him to attack Darwin's conclusions. Our author quotes contemporaneous records, known to Darwin but set aside in his time, to show that no elevation took place. Much of the testimony is of a purely negative character. Modern observers are cited to show no existing evidence of the supposed change of level, and Lyell's admission that the coast appears to have subsided to near its former level is used to make it appear doubtful if there was any uplift whatever. It is suggested that the throwing up of jetsam by a seaquake wave would give all the appearances of an elevated beach which Fitz Roy and Darwin describe. It is further pointed out that Darwin mistook a kitchen-midden for an elevated beach and may have been mistaken in his observations concerning the elevated beaches of 1835. The statement by Darwin that barnacles were found attached to the rocks at the elevation claimed is not considered by Suess. Altogether this section of the work does not convince one that Darwin was mistaken in his belief that the coast was elevated nine feet, however much it may have sunk since 1835.

Space does not permit a reference to all the questions which Suess discusses. Concerning deep-seated masses of igneous rocks, such as laccolites, it is only necessary to remark that he regards these as coming into the crust under the influence of tangential pressures or as filling cavities produced by the rupture of the crust in the direction of one of its radii.

In the second part of this volume the author describes the general geology of the country in front (north) of and in the rear (south) of the Alps, defining the foreland as the area towards which the mountain-built rocks have been pushed. He shows that the folded strata of the Carpathians have advanced upon the rocks of the 'platform of Russia.' Farther west, in Franconia and Swabia, the country is broken up into fault-blocks, the parts which stand up forming 'horsts.' In the case of the Ries and and Höhgau circular areas of depressed rocks occur as if the crust had there been punched downward. Such areas are supposed to be bounded by several lines of faulting rather than by a single circular fault.

The direction of the Alpine system is found to be that of a flattened down S, including the Carpathians, the Alps, the Apennines, Sicily, the Atlas range of northern Africa, the Pillars of Hercules and the mountains of the south coast of Spain. The plateau of Bohemia, the region of the Adriatic and the western Mediterranean are held to be comparable areas characterized by depression. Special chapters are devoted to the evidence of their structural likeness. So much of this evidence is found in the region of the Mediterranean Sea that an essay, one of the most instructive in the work, is devoted to the geological history of this water-body. Its several stages of enlargement and curtailment of area, and the changes of level it has undergone, with its variations in salinity, are fully treated, together with a synopsis of the several groups of deposits marking its development.

One of the astonishing results of the author's studies is his conclusion that in the second stage of the Mediterranean its shore-line was from 440 to 450 meters above the present sea-level. This stage corresponds in age with the Upper Miocene. The reason Suess assigns for this conclusion is apparently found in the statement (p. 412),

concerning certain beds of this stage, that 'between Brünn and Olmutz (in Moravia) there exists a large number of these outliers in the form of isolated buttes, of which the upper plateau, formed of limestone with Lithothamnium, attains very uniformly the altitude of from 350 to 355 meters. Nevertheless at Ruditz, not far from Brünn, this formation occurs as high up as 435 meters, and at an elevation of 429 meters at Abtsdorf, towards the bottom of the great gulf of Bohemia. If we assume, as Suess does, that broad sheets of flat strata cannot have been elevated to their position, they must have been deposited at that or a higher level. Hence, the adjacent lower lying deposits of the same stage, together with the sea-level, have been depressed.

Two chapters are devoted to the great desert plateau of the Sahara and to the fragments of the Indian continent, or Gondwana-land. The lands of these areas are held to be the oldest in the eastern hemisphere. The geological knowledge concerning this district is fairly well summarized, the faults and evidences of change of level by displacement being particularly set forth. In the sequel of this work Suess promises to consider whether the sinking of continents so vast as the lost areas of Gondwana-land has been able to produce a general lowering of the shore-lines and so determine the emergence of plateaus like that of Sahara and Arabia.

Two long chapters are devoted to a description of the mountain chains of India and Central Asia, presenting a good summary of the geology of these regions. North and South America then come in for discussion and comparison with typical Alpine areas. Concerning the earthquakes of the South American coast, Suess holds them to be 'the index of some great tectonic phenomenon of the present epoch, the nature of which is unknown.'

Closing the first volume is a chapter on The Continents. Our author, admitting the difficulty which arises in deciding upon characters which should be accepted in defining the age of a continent, thinks it best to fix its birth 'from the time when the sea has definitely abandoned the large depressions in its area.' In this light North America is held to be no older than the Laramie. In this same point of view, Gondwana-land is much older than America.

Many interesting questions, which the above outline of Suess's views will raise in the mind of the physical geologist, will best be deferred for discussion in connection with the promised second volume of the work, in which it is understood they are to be treated by the author himself.

The first volume is accompanied by a list of contents and is well printed. The pages bristle with footnotes and bibliographic references, the larger part of which are due to the comprehensive grasp of the current literature of geology which M. De Margerie has more than once displayed. As a key to the geology of a large part of the globe the book is invaluable on this account alone. The illustrations are few in number, but good. Many points in the distribution of geological formations on which the argument so often depends might be made clearer to a large class of students by the addition of a few more maps. An atlas as detailed as Stieler's Hand-Atlas is really necessary for following some of the descriptions in an intelligent way. While one closes the book without being convinced that the author's point of view and his interpretation of certain fields are necessarily the only or the right ones, he does so with a feeling of renewed interest in the geology of large areas and in the great physical problems of the earth. Every advanced geological student should read the book for information, for suggestion, for a broadening of his view and to see how a master in the art of writing marshals facts from one of the widest and most varied fields of natural science.

J. B. Woodworth.

A Classified Catalogue, with Localities, of the Land Shells of America, North of Mexico. By H. A. Pilsbry. Philadelphia, April, 1898. Pp. 35.

The appearance of a new catalogue of North American land mollusca is a matter of interest, not merely to malacologists, but to all students of geographical distribution. Mainly through the efforts of Mr. Pilsbry, our snails have been newly classified in recent years, more nearly in accordance with their relationships than heretofore. At the same time, the genera have been divided into subgenera and sections, while

numerous new species and subspecies have been described, so that in all respects the new list is very different from its predecessors.

Looking through the list, from the standpoint of the student of geographical distribution, we notice the following points as worthy of comment:

1. Notwithstanding our proximity to the Greater Antilles, of which we have an especially lively realization at the present time, we get scarcely more than a tinge of their wonderful snail fauna, even in Florida. Thus the list includes but two Cyclostomatidæ, both West Indian species, and these confined to the hot part of Florida. This seems really remarkable, when we remember the innumerable species of this family in Cuba, and remember, further, that they are operculate and might, therefore, be supposed to resist the sea water and readily travel on floating trees.

2. The northward distribution of Mexican types is interesting. *Bulimulus* has kept to the lower levels, as is its wont, but has got as far (*B. dealbatus*) as North Carolina, Kentucky and Alabama. *Holospira*, on the other hand, occupies mainly the tableland, and even the tops of the mountains in southern New Mexico, but not north of the middle of that Territory. It is a Southern type, extending into the upper Sonoran zone, like the bee-genera *Centris*, *Exomalopsis*, etc.

3. The distribution of our typically American snails, *Polygyra* (sens. lat.), is especially interesting. They are, of course, in great force in the eastern United States, from north to south, and well into Canada. A section of them inhabits the Pacific coast region, and goes inland, like certain slugs of the same region, to northern Idaho. In Wyoming and Colorado the genus is totally lacking, but coming down to New Mexico we find a southern section of it appearing, but only at high elevations. This last-mentioned section extends down to the tableland of Mexico, and even to the lowest levels on the eastern side. It seems possible that *Polygyra* once inhabited the whole Rocky Mountain region, but that during glacial times was exterminated as far south as the ice went, which must have been about to its present northern limit. It could not well live on the low, dry plains, but survived on the moister, forest-clad mountains southward, where it can be found to this day. It may be, therefore, that *Polygyra* will yet be found fossil in Colorado and Wyoming.

4. In the Limacidæ (the ordinary slugs) six species are listed; but it is not stated, as it should be, that three have been introduced by man. The remaining three are all very close, indeed, to European forms; indeed, it has been held on very good authority that *Agriolimax campestris* is not a species distinct from the European *A. lævis;* while I have more than once examined the Pacific coast *Amalia hewstoni* both internally and externally, and cannot see that it is anything but *A. gagates*. Yet there is no doubt that *Ag. campestris* and *Am. hewstoni* are native with us; the former is common almost all over the country. It is a very striking thing that we should have so few Limacidæ, and these so little peculiar, when Europe is so rich in large and beautiful types of this family.

5. The Arionidæ, another family of slugs, is well represented in Europe; but, apart from an introduced species, totally wanting in this country except in the Pacific coast region, extending to northern Idaho, as above mentioned. Here, however, it extends from British Columbia to southern California, and has at least fourteen species, belonging to seven distinct genera, all endemic!

Many other interesting facts can be gleaned from a perusal of the list, but it would take too much space to enumerate them. Of adverse criticisms we have few to make, and these relate to minor points of no general interest. The subfamily Arioninæ should not be credited to Pilsbry, as it was indicated and named by W. G. Binney in 1864, and is only now restricted by Pilsbry. The proper citation would be Arioninæ (W. G. Binn.) Pilsbry. *Veronicella* should unquestionably be used in place of *Vaginulus*. Other such matters could be mentioned, but we may leave the subject with the wish that so useful a list might be compiled for many another division of our fauna, at least for the fresh-water mollusca, which have not been catalogued properly in recent times.

T. D. A. COCKERELL.

MESILLA PARK, N. M., May 5, 1898.

Bibliographia geologica répertoire des travaux concernant les sciences géologiques dressé d'après la classification décimale et formant la partie (549–571) de la Bibliographia Universalis. Par Michel Mourlon, Directeur du Service géologique de Belgique avec la collaboration de G. Simoens, Docteur en sciences minérales, attaché au Service. Bruxelles, 1898.

This publication is accompanied by two pamphlets, 'Liste des périodiques compulsés pour l'élaboration de la bibliographia geologica dressé d'aprés la classification décimale par le Service géologique de Belgique,' and 'La classification décimale de Melvil Dewey appliquée aux sciences géologiques pour l'élaboration de la bibliographia geologica par le Service géologique de Belgique.'

Bibliographic work of the science of geology has heretofore been of a very fragmentary character and limited both geologically and geographically. But now we have here an attempt to compile for a definite period a universal bibliography of geologic literature. Bibliographic works have always been welcomed by geologists, and this one will surely receive its full quota of approval. The difficulties which attend the labor of preparing bibliographies of books written in languages with which one is more or less unfamiliar can hardly be realized. The various monographs, bulletins, proceedings, transactions, journals, memoirs, etc., published in many different cities and under the auspices of various government organizations and societies are full of pitfalls to one in a distant country who is not personally familiar with their methods of procedure, times of publication, etc. The various omissions in this work which are due to such causes have been passed over. Attention is here directed to the method of arranging the bibliographic matter and also to the scheme of indexing, which is somewhat new in its use for this purpose, and to which there appear to be certain fundamental objections which are inherent in the plan itself.

In this bibliography there is no alphabetic arrangement by authors' names, not even under the various subheadings. Apparently the papers are arranged under subheadings according to the index number—that is, papers that belong under one subheading and have the index number 549.1 are grouped together; then 549.2 follows, and so on. Hence if you wish to find a particular paper you must know the subdivision of geology and index number under which it would be listed before you could find the reference to the proper publication. The arrangement is particularly unfortunate, and it is quite evident that in any bibliographic publication there should be one alphabetic arrangement by authors' names.

The classification of any branch of science is something that is always subject to modification, as our knowledge increases and ideas change. Such a classification should not only be elastic, but able to be rearranged to suit the ideas and needs of the individual without impairing its usefulness as a whole. The subject classification adopted for this portion of the *Bibliographia Universalis* will hardly meet with general approbation. The character and occurrence of metaliferous deposits can be classified under mineralogy only on the widest acceptation of the term, and is a rule not applicable to a minute classification. Certain subdivisions of stratigraphy under the heading geology are local, and are recognized by but few geologists, and only in restricted areas.

The decimal system of classification employed in this bibliography is used for putting books in order on the shelves of libraries, and is a quick method of finding them. Its value for such a purpose is no criterion by which to judge of its usefulness in a detailed classification of our knowledge of various subjects. Such an arbitrary system might be useful to the individual formulating it, but does not necessarily fulfill the requirements of a number of individuals.

The numerical system is open to the further objection that but a small amount of indexing is practicable, and that of a very general character. To illustrate this take the following example from this publication. In the notice of the Monograph on the Denver Basin of Colorado, by Emmons, Cross and Eldridge, the index number given is 551.7. 55 refers to geology, 551 to the physical structure of the globe, and 551.7 to stratigraphy. Indexing under such general headings conveys a very inadequate conception of the extent and character of this publication. To index it with some degree

of detail would require something like this: 549.8, 551.35, .4, .49, .71, .751, .762, .763, .78, .79, 552.11, .13, leaving out entirely the part relating to paleontology. Translating these numbers we have: 549, mineralogy; 549.8, combustible materials, coal; 55, geology; 551, physical structure of the globe; 551.35, erosion; 551.4, physiography; 551.49, hydrography; 551.71, pre-Cambrian; 551.751, Carboniferous; 551.762, Jurassic; 551.763, Cretaceous; 551.78, Tertiary; 551.79, Pleistocene; 552, lithology; 552.11, acid rocks; 552.13, basic rocks.

This is by no means an exceptional case, and there are many papers in this bibliography which require just such an analysis to give any one a satisfactory idea of their scope and character.

The attempt to classify our scientific knowledge by rows of figures will fail to meet the requirements of the average student. Any system, whatsoever, based on such a principle will require considerable effort to become sufficiently familiar with it to be readily employed, and it will be necessary to use it frequently in order to retain it in the memory. The average geologist will find it extremely inconvenient to fulfill either or both of these requisites.

F. B. WEEKS.

U. S. GEOLOGICAL SURVEY.

SCIENTIFIC JOURNALS.

American Chemical Journal, June: 'The Action of Zinc on Copper Silicide:' By G. DE CHALMOT. When molten zinc is added to melted copper silicide the two metals combine and the silicon separates in a crystalline condition. 'On the Colored Compounds obtained from Sodic Alcoholates and Picryl Chloride:' By C. L. JACKSON and W. F. BOOS. A number of complicated compounds have been isolated and studied. On the 'Action of Orthodiazobenzenesulphonic Acid on Methyl and Ethyl Alcohol:' By E. C. FRANKLIN. In these experiments the alkoxy reaction alone took place. The only effect due to increase in pressure was an increase in the yield of the alkoxy product. The action of nitric acid on the amides was also studied. 'On the Taste and Affinity of Acids:' By J. H. KASTLE. In a series of experiments the author found that those acids which were stronger had the sourer taste. 'The Action of Nitric Acid on Tribromacetanilide:' By W. B. BENTLEY. The author was unable to obtain the nitric product described by Remmers. 'Researches on the Cycloamidines, Pyrimidine Derivatives:' By H. L. WHEELER. 'Some Double Salts Containing Selenium:' By J. F. NORRIS. 'On Phenylglutaric Acid and its Derivatives:' By S. AVERY and ROSA BOUTON. 'On α-Methyl-β-Phenyglutaric Acid:' By S. AVERY and M. L. FOSSLER. J. ELLIOTT GILPIN.

THE *American Journal of Science* for June, which completes Volume V. of the 4th series, contains as its first and longest article an account of the stratification of the electric discharge in Geissler tubes, with a theory of their cause and an account of some experiments made to test it. There are short articles on geological and mineralogical subjects by Messrs. W. Lindgren, H. W. Turner, J. H. Pratt, H. F. Bain and H. S. Washington. Mr. R. G. Leavitt describes a psycrometer, and Mr. L. C. Jones the action of carbondioxide on soluble borates. The number concludes with an article by Dr. F. H. Bigelow, reviewing his recently published bulletin of the Weather Bureau on solar and terrestrial magnetism in their relations to meteorology.

Appleton's Popular Science Monthly for June contains a portrait and sketch of Andrew Crombie Ramsay. Professor Heilprin continues his account of aspects of nature in the Sahara, and Dr. G. A. Dorsey describes a cruise among Haida and Tlingit villages of the Northwest coast. Professor D. R. McAnally writes on the Roman highways, and Dr. W. L. Howard on the physiology of strength and endurance. There are two articles on scienfific education and an article by Professor W. H. Hudson on veracity. In so far as the *Monthly* is 'timely' it has the courage of its convictions and publishes an article on 'Peace as a Factor in Social and Political Reform' and an editorial entitled 'A Victim of Militarism.'

THE publication of a monthly *Revista di scienza biologiche* under the editorship of Professor Enrico Morselli is announced. It proposes to cover somewhat the same field as the

American Naturalist and *Natural Science* and has the coöperation in England of Sir John Lubbock and in America of Professor J. Mark Baldwin. Subscriptions may be addressed to Dr. Paulo Celesia via Assarotte 46. Genoa.

Messrs. John Bale, Sons and Danielsson, London, announce the publication of a *Journal of Tropical Medicine* to be edited by Mr. James Cantlie, who for some years practiced in Hong Kong, and by Dr. W. J. Simpson, who was until recently medical officer of health for Calcutta.

The State Board of Health of Michigan has established a Teachers' Sanitary Bulletin to be issued monthly. It promises to contain information of great value to the teacher, and sets an example that could be followed to advantage in other States. The first numbers contains an address by Dr. F. G. Novy on 'germs, what they are, and how they produce diseases,' and an article by Dr. H. B. Baker on 'isolation and disinfection of persons and things.' The number also contains several statistical charts.

Mr. James G. Biddle, of Philadelphia, has begun the publication of a monthly Bulletin intended to be of interest to those who use scientific instruments. The subscription price is 50 cents per annum.

SOCIETIES AND ACADEMIES.

GEOLOGICAL SOCIETY OF WASHINGTON.

At the 80th meeting, held in Washington on May 25, 1898, Dr. A. C. Spencer and Dr. Geo. H. Girty read a joint paper on the Devonian in Southwestern Colorado.

In one of the early bulletins of the Hayden Survey, F. B. Meek described a small collection of fossils which had been brought in from the southwesterm part of Colorado by F. M. Endlich. The specific characters of a *Rhynconella*, which was very abundant, led him to designate the age of the limestone in which they occurred as Devonian. Some weight was added to this opinion by associated forms which were only generically recognizable. During the field season of 1897 *Rhynconella endlichi*, which has since been assigned to Camarotœchia (Plethorhyncha), was found associated with a number of forms which corroborate Meek's determination as against those who have supposed a probable Carboniferous age. The Devonian strata lie in apparent conformity with a supposed Carboniferous section.

The stratum from which the fossils were obtained is a heavy limestone about 100 feet thick. Below it there are about 50 feet of shales not well exposed and a heavy quartzite 50 feet in thickness which rests upon an eroded surface of crystalline rocks. A basal conglomerate is locally present. The following forms have been identified by Dr. Girty: *Fenestella* sp.; *Orthothetes Chemungensis? Productella* cf. *spinulicosta*; *Rhynchonella* sp.; *Camarotœchia* (*Plethorhyncha*) *Endlichi*; *Cyrtia* n. sp. *a*; *Cyrtia* n. sp. *b*; *Athyris* sp.; *Naticopsis gigantia? Euomphalus* sp.

The last paper of the evening was one by Mr. S. F. Emmons, on the 'Geology of Southern Russia,' illustrated by lantern slides. This included some account of Donetz Basin, which has been developed within the last ten or fifteen years, and promises to become one of the most important industrial centers of the Empire, containing large areas of coal of various kinds as well as important deposits of mercury and rock salt, together with ores of gold, silver, lead, zinc and iron as yet imperfectly developed. Some account was given of the Caucasus mountains, their geological structure and the varied races that dwell within their valleys; also of the important deposits of petroleum in the Tertiary beds along their flanks, especially of those at Bakou, on the Caspian Sea, which already rival in the amount of their production those of the United States. The enormous deposits of glauber salts in the Karabugas gulf, on the eastern side of the Caspian, their origin and their bearing upon the origin of petroleum, were also described. Likewise the peculiar conditions of the waters of the Black Sea, their greater salinity, higher temperature, contents of H_2S and entire absence of organic life below the 100-fathom level, and the points of resemblance between their condition and those that prevail in the Arctic Ocean, as found by Nansen. Finally, the interesting geological features of the Crimean peninsula, which appears to be a segment of the northern flanks of the Caucasus, left upon engulfment of the rest of this portion of the range beneath the waters of the Black Sea.

In addition to the above, Dr. W. F. Hillebrand read an important paper on the 'Distribution and Quantitative Occurrence of Vanadium in the Rocks of the United States,' but to attempt to abstract it here would not give satisfactory results.

WM. F. MORSELL.

TORREY BOTANICAL CLUB.

THE scientific program on March 30th included three papers, of which the first, by Dr. V. Havard, Surgeon U. S. A., was upon 'The English Names of Plants.' He said that, the necessity for English names being recognized, botanists should decide on the principles which are to determine their selection and formation, so as to secure greater uniformity, simplicity and usefulness. To each plant an authorized vernacular binomial should be assigned, so that ambiguity and confusion may be avoided. In the absence of suitable English names, already recognized, it seems best to adopt the Latin genus name, if short and easy, like *Cicuta*, *Parnassia*, *Kalmia*, *Hibiscus*, or a close translation thereof, when possible, like *Astragal*, *Chenopody*, *Cardamin*, while the specific English name should be an equivalent of the Latin one or a descriptive adjective.

As to construction, the rules recommended are as follows: In case of all English binomials clearly applying to well-known individual species and no others, all substantives are capitalized without hyphen, as in Witch Hazel, May Apple, Dutchman's Pipe. In all genera in which two or more species must be designated, the genus name is compounded into one word without hyphen, as Peppergrass, Sweetbrier, Goldenrod, Hedgenettle, etc., except in long names, where the eye requires the hyphen, as Prairie-clover, Forget-me-not. Genus names in the possessive case (St. John's-wort) are written with the hyphen followed by a lower-case initial. Plants commemorating individual men (Douglas Spruce, Coulter Pine) are written without the marks of the possessive. In specific names participial endings are suppressed, the participle becoming a substantive which is added as a suffix, without hyphen, thus Heart-leaved Willow is changed to Heartleaf Willow.

Discussion followed, Dr. Britton, Mr. Clute, Mr. Rydberg, the Secretary and others participating. Commendation was given to the attempt to simplify, to make use of the vernacular, and to secure greater euphony. President Brown and Dr. T. F. Allen deprecated the manufacture of book-names. Dr. Allen also pointed out the confusion which has resulted from the improper transfer of English and German names to plants which are kindred but not identical. Professor Burgess defended the use of vernacular names, saying that they deserve more attention, and that in their absence the generic name should be used unchanged. "Many Latin names, as *Portulaca*, win their way without change as soon as once fairly made familiar. Coined names seldom live; a name to be successful must be a growth, as language is. Allowance must be made for new discoveries, even in supposed monotypic genera. Names like Witch-hazel are fitly treated as themselves generic, not binomial. To drop the possessive often loses from our thought an association with the discoverer which is worth preserving. To drop the participle ending -ed is often, however, a distinct gain, both in securing compactness and expressiveness."

The second paper, by Dr. N. L. Britton, 'The Genus *Parthenium* in Eastern North America,' was a description of a new species of Parthenium, from near Charlotte, Va., intermediate in leaf-margin between the pinnatifid leaves of tropical species and the subentire leaves of the type *P. integrifolium*. Plants of the latter from White Sulphur Springs, Va., are now cultivated at the New York Botanic Garden.

The third paper, 'The Influence of the Nucleus upon the Formation of Cell Walls,' was by Professor C. O. Townsend. "It was observed by Klebs (Pfeffer, Untersuch. a. d. Botan Institute z. Tübingen, Bd. II., p. 500) in 1888 that when cell contents are separated into two or more parts by plasmolysis, only the part containing the nucleus is capable of forming a new cell wall. In the following year Palla (Flora, p. 314) performed a series of experiments in which cell walls seemed to be formed around the nucleus-free protoplasmic masses. The experiments undertaken in 1895 by the writer (Pringsheim's Jahrbücher, 1897) were solely to determine whether or not the nucleus is neces-

sary for the formation of cellulose. It was found that when the cell contents were plasmolysed, the protoplasmic masses usually remained connected by protoplasmic threads. When these threads were broken, so that there was no possible connection with a mass of protoplasm containing a nucleus, no new cell walls were formed. If a protoplasmic mass was completely separated from the nucleus in its own cell it was found that the influence necessary for the formation of cell walls could travel from the adjacent cells by means of the protoplasmic connections. Simple contact without living protoplasmic connections was not sufficient to induce the formation of cell walls. If, however, the protoplasmic connections were not broken the influence of the nucleus was capable of traveling over a distance of several millimeters."

Edward S. Burgess,
Secretary.

NEW YORK ACADEMY OF SCIENCES—SECTION OF GEOLOGY AND MINERALOGY, MAY 16, 1898.

Mr. Geo. F. Kunz exhibited specimens of quartz crystals found in massive gypsum from Gallineo Springs, New Mexico, and announced the discovery of a new meteorite from Ottawa, Kansas.

The first paper on the program was by Professor D. S. Martin on 'The Geology of Columbia, South Carolina, and its Vicinity.' Professor Martin described the granitic and gneissic rocks of that region and their residual products. He also commented on the character of the Potomac, Lafayette and Columbia formations, which are well exposed in the railroad cuts to the south of the city.

The paper was discussed by Professor Dodge and Dr. Ries.

The next paper of the evening was by Professor Kemp, entitled 'Some Remarks on Titaniferous Magnetites.' The speaker discussed the formula of ilmenite, and stated that it was probably a mixtnre of $FeOTiO_2$ and nFe_2O_3. The amount of titanium present in the titaniferous magnetites is very variable, running sometimes as high as 40%; in the Adirondack areas it is 10–20%.

Magnetic separation has not yet proved successful for the elimination of titanium from these ores. Nearly all of the titaniferous magnetites show small amounts of MnO, Cr_2O_3, CoO, NiO and MgO. The latter suggests the presence of spinel. SiO_2 and Al_2O_3 have also been found, and V_2O_3 has been recorded in a few instances. Professor Kemp suggested that these minor constituents might have some influence on the metallurgical behavior of the ore. Phosphorus and sulphur are very rare. The native and foreign occurrences of the titaniferous magnetites were also alluded to.

The paper was discussed by Professor Martin, Dr. Ries and Mr. Kunz.

Heinrich Ries,
Secretary of Section.

BOTANICAL SEMINAR OF THE UNIVERSITY OF NEBRASKA.

At the meeting of the Botanical Seminar of the University of Nebraska on April 23d papers were read as follows: 'Recent Investigation of the Cyanophyceæ,' by F. E. Clements; 'The Morphology of Ginkgo,' by C. E. Bessey; 'Hitchcock's Ecological Plant Geography of Kansas,' by Roscoe Pound; 'Cell Division in Ascomyceteæ,' by A. T. Bell.

At the meeting on May 21st the following papers were read: 'The Proper Conception of Plant Ecology and Plant Geography,' by Roscoe Pound; 'Vegetation Pressure,' by F. E. Clements; 'The Development of the Pistils of Alismaceæ, Ranunculaceæ and Rosaceæ,' by Ernest A. Bessey.

NEW BOOKS.

Revised Text-book of Geology. James D. Dana. Edited by Wm. North Rice. New York, American Book Co. 1898. Pp. ix+482.

La famille Néuropathique. Ch. Féré. Paris, Alcan. 1890. Pp. 352.

A Manual of Quantitative Chemical Analysis. E. F. Ladd. New York, John Wiley & Sons. 1898. Pp. vi+82.

Political Crime. Louis Proal. New York, D. Appleton & Co. 1898. Pp. xxii+355.

Die Zelle und die Gewebe. Oscar Hertwig. Jena, Gustav Fischer. 1898. Pp. viii+314. 7 Marks.